IN THE MATTER OF:

Qinglong HAO

GROUP: 1755

SERIAL NO.: 09/646,978

EXAMINER: Koslow, Carol M.

FILED: September 25, 2000

FOR: LIGHT-EMITTING MATERIAL AND PRODUCING METHOD THEREOF

Commissioner for Patents
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Supplemental Declaration Under 37 CFR 1.132

We, Qinglong Hao, Pengcheng Li, Jingfeng Gao, Qian Xu, and Atsushi Ogura, are the inventors of the present invention stated in the US patent application No. 09/646,978 and not only have thorough knowledge of the present invention and references cited thereto but also are familiar to the art on which the present invention is based.

We, Qinglong Hao, Pengcheng Li, Jingfeng Gao, Qian Xu, and Atsushi Ogura, hereby declare that:

1. The invention as claimed in the subject application was not claimed in the cited reference Hao et al (US 5,885,483) and to the extent that any invention in common with the invention of this subject application is disclosed but not claimed in Hao et al '483, such invention was derived only from the inventors of this application and is thus not an invention "by another". The two inventors Jun Li and Banshan Lu recited in the Hao et al '483 patent are not the inventors of the subject application and did not contribute to, or participate in, the invention as claimed in the subject application. Stated otherwise, the two inventors Jun Li and Banshan Lu of the cited reference Hao et al '483

1

did not participate in the discovery of the light emitting material with the structure claimed in claims 10 and 11 and did not participate in the method of producing this light emitting material as claimed in claims 12-16. The invention as claimed in the subject application was derived only by the inventors of this application and thus cannot be an invention "by another", since as explained above, the two other inventors recited in Hao '483 did not contribute to the invention.

2. For purpose of clarification the declaration of the inventors executed in December 2002 was in error in making reference to the inventors and assignees of the subject application as being the same as in the Hao et al '483 patent when in fact the two inventors, viz., Jun Li and Banshan Lu, recited in the Hao et al '483 patent are not in common with the other inventors of the subject application and that only Chemitech is a common assignee to both the Hao et al '483 patent and the subject application. However, the other inventors Qinglong Hao, Pengcheng Li, Jingfeng Gao and Qian Xu in the Hao et al '483 patent are in common with the inventors of the subject application.

3. The objection to the disclosure is based on a misunderstanding of the subject invention. The invention does not reside in the composition of the samples 1-5 in Table 1 all of which were produced in accordance with the present invention from the raw materials of $SrCO_3$, Eu_2O_3, and Dy_2O_3 and may vary as long as the element B remains between 0.2-1.0% by weight, and the elements Eu and Dy are present in a range between 0.5 to 3.0% by weight and 0.01 to 3.0% by weight respectively. It should be understood that the variable range content of the B element in the new compound is 0.1-1.0% by weight, and the variable ranges of the content of the Eu element and the element Dy is 0.5 to 3.0% by weight and 0.01 to 3.0% by weight respectively corresponds to the average values for each of the elements B, Dy and Eu in the A phase and the B phase respectively. One of ordinary skill in the art can readily produce the compound of the present invention based solely upon the written description without the compositions of sample 1-5 in Table 1.

3.1. The formula $(Sr, Eu, Dy)_{0.95\pm x}(Al, B)_2O_{3.95\pm x} \cdot (Sr, Eu, Dy)_{4-x}(Al, B)_{14}O_{25-x}$ indicates the resultant and not the raw materials. The resultant is a compound that has paragenesis crystalline consisting of an A-phase which is represented by $(Sr, Eu, Dy)_{0.95\pm x}(Al, B)_2O_{3.95\pm x}$ and a B-phase which is represented by $(Sr, Eu, Dy)_{4-x}(Al, B)_{14}O_{25-x}$.

By adjusting the amount of Sr relative to (Al, B), the ratio of the A-phase to B-phase can be changed. The amount of $SrCo_3$ and Al_2O_3, H_3Bo_3 in the first embodiment is different from that in the second embodiment causing the ratio of the A-phase to B-phase in the first embodiment to be different from the second embodiment. The subject formula $(Sr, Eu, Dy)_{0.95\pm x}(Al, B)_2O_{3.95\pm x} \cdot (Sr, Eu, Dy)_{4-x}(Al, B)_{14}O_{25-x}$ teaches a paragenesis crystalline material consisting of an A-phase of $(Sr, Eu, Dy)_{0.95\pm x}(Al, B)_2O_{3.95\pm x} \cdot$ and a B-phase of $(Sr, Eu, Dy)_{4-x}(Al, B)_{14}O_{25-x}$. It does not mean that the ratio of A-phase to B-phase is 1:1.   In fact, the ratio of B-phase to A-phase in the first embodiment is bigger than the ratio of B-phase to A-phase in the second embodiment. Moreover, when the ratio of metal cation in the raw material such as $SrCo_3$, Eu_2O_3, Dy_2O_3 is changed, the ratio of A-phase to B-phase in the resultant is correspondingly changed. This changes the optical properties of the resultant. In the light of the embodiments of the present specification, since the raw materials such as $SrCo_3$, Eu_2O_3, Dy_2O_3 are increased in the second embodiment, the metal cations such as Sr^{2+}, Eu^{3+}, Dy^{3+} are increased. By increasing the metal cations the content of A-phase increases and the content of the B-phase in the resultant decreases.

3.2 From the above, it should be clear that it is not necessary for the subject invention to know the individual amounts of B, Eu and Dy in the above formula. One skilled in the art does not need to know the individual amounts of B, Eu and Dy in the above formula or to know the composition of the samples 1-5 in Table 1.

3

4. Table 1 in the specification is intended only to show how Applicant has measured brightness of different samples 1-5 based upon a calculation of standard deviation. The composition of each of the samples 1-5 satisfy the formula for the light emitting material as claimed but vary from one another only by the individual amounts of B, Eu and Dy, with the ratio of the amount of Sr to (Al, B) changed to vary the ratio of the A-phase to B-phase. The main peak of light-emitting spectrum of the A-phase is 520nm. The main peak of light-emitting spectrum of the B-phase is 490nm. The properties of the compound of the present invention result from the paragenesis crystalline compound consisting of A-phase and B-phase as defined. Since the compound of the present invention is a paragenesis crystalline material consisting of A-phase and B-phase, the new compound is clearly different from any taught in the prior art. However, applicant is certainly willing to identify the composition of each of the samples 1-5 to satisfy the Examiner and to incorporate the specific composition of each sample in the Table if permitted to do so by the Examiner.

5. As regards the question of afterglow time, the prior art tells us that the formula of decaying of energy can be used to compute the brightness of the light-emitting material as it decays. Using the formula: $l_1 = l_0 t^{-n}$, for the decay of energy where n is the constant of the decay time and l_0 is the initial value of the brightness. (When t equals to 5s, we use a value of l_0 that is 8430mcd/m^2.)

When t=28800s, l_{28800} = 10mdc/m2, we can compute the constant of the decay time according to the formula. The constant of decay time for the compound of the present invention is 0.66. Typically, the constant of the decay time is in a range from 0.6 to 0.75. Since the minimum visible brightness is 3mcd/m_2, if the constant of the decay time is 0.66, according to the formula, we can then compute the decay time.

Accordingly, when t=5s,

The brightness of Sample No. 1 is 8400mcd/m^2

The brightness of Sample No. 2 is 8450mcd/m^2

The brightness of Sample No. 3 is 8400mcd/m^2

The brightness of Sample No. 4 is 8500mcd/m^2

The brightness of Sample No. 5 is 8430mcd/m^2.

So, the Average value of the brightness =
8400+8450+8400+8500+8430)mcd/m^2/5=8430mcd/m^2.

According to the standard deviation formula as, standard deviation = square root of $[(a-\bar{a})^2+(b-\bar{a})^2+(c-\bar{a})^2+.....+(n-\bar{a}]/n$+ rectified value = square root of $[8400-8430)^2+(8450-8430)^2+(8400-8430)^2+(8500-8430)^2+(8430-8430)^2]/5+5=45$.

According to the Relative standard deviation formula as,

Relative standard deviation = square root of $[(a-\bar{a})^2+(b-\bar{a})^2+(c-\bar{a})^2+.....+(n-\bar{a})^2]/n^2$+ rectified value

= Square root of $[8400-8430)^2+(8450-8430)^2+(8400-8430)^2+(8500-8430)^2+(8430-8430^2]/5 \times 8430^2+0.03\%$

=0.5%.

The values of standard deviation and relative standard deviation in table 1 are calculated according to the same way.

Based on the computation described above, the specification is intended only to substantiate that we have discovered a "visible afterglow time of 80 hours or longer".

6. Based upon measurements of brightness from the samples of Table I, the light emitting material of the present invention showed brightness of about $8500 mcd/m^2$ after five seconds from instant irradiation. As shown in table 1 the brightness at the 480th minute after stopping irradiation was more than $10 mcd/m^2$ and the number of hours to further decay down to $3 mcd/m^2$ for each of the examples 1 and 2 was above 80 hours as set forth on page 7 of the specification substantiating a visible afterglow time of 80 hours or longer. Accordingly the afterglow time in the specification between the table and examples is consistent and proves that the light emitting material of the present invention has an excellent visible afterglow time.

7(a). The formula $(Sr,Eu,Dy)_{0.95\pm X}(Al, B)_2O_{3.95\pm X} \bullet (Sr, Eu, Dy)_{4-X}(Al, B)_{14}O_{25-X}$ is a chemical formula which properly represents a complex bi-phase crystalline material as disclosed and claimed in the present patent application. The formula means that the bi-phase crystalline material complex consists of an A- phase having the formula $(Sr,Eu,Dy)_{0.95\pm X}(Al, B)_2O_{3.95\pm X}$ and a B-phase having the formula $(Sr, Eu, Dy)_{4-X}(Al, B)_{14}O_{25-X}$. The A-phase and B-phase together have paragenesis crystallization. Thus, the two examples only show how afterglow is affected when the individual amounts of $SrCO_3$, Eu_2O_3, and Dy_2O_3 are changed even though the total amount of all three elements, Sr, Eu, and Dy in combination remains the same. The difference between the first and second examples resides in the individual amounts of $SrCO_3$, and Dy_2O_3.

7(b). In summary, the compound of the subject invention is independent of the different ratio of raw materials in the compound expressed by the formula of claim 10 and has excellent afterglow properties.

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Signatures Of Inventors

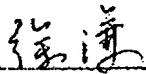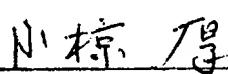_____郝庆隆_____ Date _3/ /10 / 2005_
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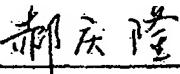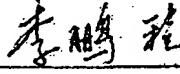
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7